

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
13 November 2003 (13.11.2003)

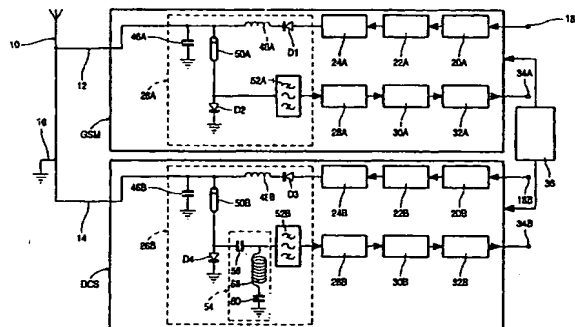
PCT

(10) International Publication Number  
**WO 03/094346 A1**

- (51) International Patent Classification<sup>7</sup>: **H03H 7/46** (74) Agent: **WHITE, Andrew**; Philips Intellectual Property & Standards, Cross Oak Lane, Redhill, Surrey RH1 5HA (GB).
- (21) International Application Number: PCT/IB03/01704
- (22) International Filing Date: 25 April 2003 (25.04.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
0209959.6 1 May 2002 (01.05.2002) GB
- (71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **BOYLE, Kevin, R.** [GB/GB]; c/o Philips Intellectual Property & Standards, Cross Oak Lane, Redhill, Surrey RH1 5HA (GB).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report

[Continued on next page]

(54) Title: IMPROVEMENTS IN OR RELATING TO WIRELESS TERMINALS



(57) Abstract: A wireless terminal having a dual band antenna arrangement which comprises a planar inverted-F antenna (10) having a first feed (12) for signals in a first, lower frequency band, for example the GSM band, a second feed (14) for signals in a second, higher frequency band, for example the DCS band, and a ground pin (16). A first coupling stage (26A) couples the transmit and receive paths of a first transceiver (GSM) to the first feed and a second coupling stage (26B) couples the transmit and receive paths of a second transceiver (DCS) to the second feed. Each of the first and second coupling stages comprise a quarter wavelength transmission line (50A, 50B) having a first end coupled to the respective transmit signal path and a second end coupled by band pass filter (52A, 52B) to the respective receive signal path. A first PIN diode (D1, D3) couples a transmit signal path to the first end of the respective quarter wavelength transmission line and to the respective feed (12, 14) and a second PIN diode (D2, D4) couples the second end of the respective quarter wavelength transmission line to ground. In operation when transmitting in one of the bands, the first and second PIN diodes of the relevant coupling stage are switched-on, whilst the PIN diodes in the other coupling stage are off and when in a receiving mode all the PIN diodes are off. The signal being received by one of the transceivers is reflected by the band pass filter in the coupling stage of the other transceiver.

WO 03/094346 A1



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International Classification No

PCT/IB 05/01704

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H03H7/46

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03H H01P H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 823 751 A (NOKIA MOBILE PHONES LTD) 11 February 1998 (1998-02-11) column 6, line 14-38; figure 5	1,5,6
Y	US 6 332 071 B1 (BRANDT PER-OLOF) 18 December 2001 (2001-12-18) the whole document	1,5,6
A	EP 1 187 357 A (HITACHI METALS LTD) 13 March 2002 (2002-03-13) page 1, line 19-23 page 9, line 14 -page 11, line 20; figures 15,17 page 2, line 18-48	1,5,6

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*G\* document member of the same patent family

Date of the actual completion of the international search

23 July 2003

Date of mailing of the international search report

01/08/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Coppieters, C

## INTERNATIONAL SEARCH REPORT

International  
PCT/IB 05/01704  
cation No

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0823751	A	11-02-1998	US 5768691 A	16-06-1998
			CN 1183013 A	27-05-1998
			EP 0823751 A2	11-02-1998
			JP 10093473 A	10-04-1998
			US 6115585 A	05-09-2000
US 6332071	B1	18-12-2001	SE 511749 C2	15-11-1999
			AU 753862 B2	31-10-2002
			AU 3963599 A	25-10-1999
			BR 9909467 A	11-06-2002
			CN 1304560 T	18-07-2001
			EE 200000582 A	15-02-2002
			EP 1078414 A1	28-02-2001
			JP 2002510925 T	09-04-2002
			SE 9801209 A	08-10-1999
			WO 9952172 A1	14-10-1999
EP 1187357	A	13-03-2002	EP 1187357 A1	13-03-2002
			CN 1364347 T	14-08-2002
			WO 0169807 A1	20-09-2001
			US 2002180556 A1	05-12-2002